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Preparing the social statistics system for the legalization of cannabis

by Kathryn Wilkins, Benjamin Mazowita and Michelle Rotermann

In this special edition of *Insights on Canadian Society*, Statistics Canada explains how the social statistics system will be impacted by the legalization of cannabis.

Executive summary

In anticipation of legislation (Bill C-45) legalizing cannabis for non medical use coming into force, Statistics Canada has undertaken a thorough review of its capability to evaluate the bill's impact. In the fall of 2017, the agency presented a strategy to incorporate the cannabis industry into the System of National Accounts. This document focuses on the agency's social statistics system—specifically, surveys and administrative databases designed to collect information related to health and health care; law enforcement; the justice system and community safety and well-being; education; and labour. It describes recent adjustments and initiatives undertaken to enhance the capability of assessing the impact of legalizing cannabis for non-medical use on health and social institutions, and measuring outcomes against the legislation's objectives.

In collaboration with its partners, Statistics Canada has monitored cannabis use and criminal activity associated with cannabis for years. More recently, information collection systems that support research into the possible risks and harms associated with cannabis use have emerged. The data collection instruments involve a variety of collection modes (telephone, Internet, in-person), which sometimes limit comparability of the information produced. However, each tool serves a purpose—whether it be surveillance, identification of risk factors or complex analysis. This document catalogues measures deemed essential to surveillance, along with those required for risk analysis and evaluation of the social impact of Bill C-45. The measures proposed are based on the scientific literature, expert advice from Statistics Canada's key partners, extensive review and evaluation within the agency, and lessons from jurisdictions where cannabis for non medical use has been legalized. An evaluation of cannabis-related content in the current suite of surveys and administrative databases is presented; information gaps and opportunities for further development are also identified.

A careful analysis of the current and forthcoming suite of surveys, administrative databases and other initiatives including data linkage projects reveals that Statistics Canada is well-equipped to assess most of the objectives of Bill-C45 and monitor its social impact. Basic measures of use are well-developed, and permit surveillance in vulnerable subpopulations. The development of information systems to examine cannabis-related health outcomes and health care is in progress. Tracking of cannabis-related offences, police and justice system activity is well-established. Standardized measures of risk-related behaviour including cannabis-impaired driving are in place. Statistics Canada looks forward to collaborative efforts with the provinces and territories to assess the social effects of the bill on the education and labour sectors.

Inevitably, issues that have not been anticipated will arise as the transition from an illegal to a legal cannabis market occurs. The agency will work closely with its partners in continuing to accommodate change with flexibility as its capacity to measure and analyze the impact of cannabis legalization advances.

Introduction

Canadians Legislation permitting the sale, possession and use of cannabis for non-medical purposes in Canada will be enacted on October 17, 2018.[1] The effects of the *Cannabis Act* (Bill C-45) will be of worldwide interest, as Canada will be only the second country—after Uruguay—to enact such a law. The legislation was drafted to address the following goals:

- to establish strict product safety and quality requirements in order to protect public health and safety;
- to prevent young persons from accessing cannabis and prohibit promotional activities or other enticements appealing to young people to use cannabis;
- to deter and reduce cannabis-related criminal activity by providing for the licit production of cannabis and imposing appropriate sanctions and enforcement measures;
- to reduce the burden on police and the justice system associated with cannabis offences, particularly possession;
- to inform Canadians of the risks associated with cannabis through sustained and appropriate public health campaigns.

The legislation is informed by estimates of the widespread prevalence of cannabis use. In 2015, an estimated 12% of people aged 15 and over living in the 10 provinces had used cannabis (obtained illicitly or for medical purposes) within the past year; this included 28% of people aged 18 to 24—among whom the prevalence of use is highest.[2]

In emphasizing the importance of a commitment to evidence-informed policy and the need for information by employers, educators, law enforcement, industry and health care practitioners, the Task Force on Cannabis Legalization and Regulation recommends that the federal government, "Invest in baseline data collection and ongoing surveillance and evaluation in collaboration with provinces and territories".[3]

In anticipation of the new law coming into force, Statistics Canada is preparing its statistical systems to provide the empirical evidence required to properly document and monitor the impact of the transition of cannabis for non-medical use from an illegal to a legal product in Canada. In the fall of 2017, the agency presented a strategy to adapt the economic system to incorporate cannabis as a new industry in the System of National Accounts; and to provide measures of price, production, distribution, sales, tax revenues, etc.[4] The strategy required the adaptation of the economic classifications that underpin the compilation of Canadian economic activities and the data sources that Statistics Canada uses to measure them.

This document presents efforts under way to advance the capacity of the agency's social statistics system to assess the impact of legalizing cannabis for non-medical use on the population and Canada's social institutions. The measures featured reflect the scientific literature, expert advice from Statistics Canada's key partners, extensive review and evaluation within the agency, as well as the lessons from other jurisdictions where cannabis for non-medical use has been legalized. Many are consistent with those outlined by Public Safety Canada in its comprehensive summary of performance metrics for cannabis policy consideration.[5]

Statistics Canada is aligning its statistical systems to inform the public debate with respect to the objectives of the legislation. However, it is likely that the impact of legalizing cannabis for non-medical use for adults will have consequences beyond the explicit aims of the law, and data collection systems will need to be sufficiently flexible to anticipate and address additional concerns. For example, it will be necessary to monitor changes in the prevalence of use and associated outcomes in the population as a whole, by age group and gender, and in vulnerable subpopulations, including youth, pregnant women and First Nations peoples, Métis and Inuit. Furthermore, in view of the adverse effects of cannabis on judgement and motor skills[6], trends in rates of cannabis-impaired driving collisions and traffic fatalities will be of concern.

Framework

In collaboration with its partners, Statistics Canada has for years produced information based on data from surveys covering a wide range of social issues. Data integration initiatives involving linkages among administrative databases and to survey datasets have also generated rich sources of statistics.[7] The agency is already involved in a variety of surveillance and research activities focusing on cannabis use—along with multiple other national organizations including Health Canada; the Public Health Agency of Canada; the Canadian Centre on Substance Use and Addiction (formerly the Canadian Centre on Substance Abuse); the Canadian Executive Council on Addictions; the Canadian Institute for Health Research; the Canadian Institute for Health Information; Public Safety

Canada; many provinces; and various universities. With such baseline information, Statistics Canada is fairly well-equipped to monitor the impact the legalization of cannabis for non-medical use has on usage patterns and selected risk behaviours. This document highlights the activities in which the agency is involved—either alone or collaboratively—while acknowledging important work under way in other organizations and in the provinces and territories.

To improve the capacity to monitor the use of cannabis for non-medical purposes and assess the effects of legalization on Canada's social institutions, Statistics Canada has implemented enhancements to the agency's core social statistics program. The objective is to generate data that will serve as the basis of indicators and support research on the social impact of cannabis legalization. In adapting its social statistics system, Statistics Canada will continue to work with its partners. The most notable of such efforts is the agency's long-standing collaboration with Health Canada in developing and administering national surveys designed to measure the prevalence of cannabis use; these have included the Canadian Tobacco Use Monitoring Survey (2004 to 2012) and the Canadian Tobacco, Alcohol and Drugs Survey (2013 to 2017).

This document is organized around four key social domains:

1. **Basic surveillance measures**, which include frequency of use, quantity used, purpose and method of use, along with basic sociodemographic characteristics such as gender and age.
2. **Public health and health care**, to assess the impact on the health of the Canadian population and on the Canadian health care system. Variables of concern include cannabis use disorders, co-use with other substances and health care attributable to cannabis use.
3. **Public safety and justice**, to monitor and assess the implications of the legislation on law enforcement, the administration of justice, and community safety and well-being.
4. **Other social statistics**, to assess the potential impact on various outcomes, including school dropout rates, truancy, workplace safety and work performance.

For each domain the document describes:

1. **Key indicators** required to adequately address the impact of the legalization of medical cannabis for non-medical use;
2. **Current suite of surveys, adaptations and enhancements**—the content covered and adjustments being made to address the impact of the legalization of cannabis for non-medical use[8]; and
3. **Limitations, gaps and development opportunities.**

Basic surveillance measures

This section summarizes basic measures considered key to monitoring trends in cannabis use. The usefulness of each measure in evaluating the consequences of legalization varies according to the social sector being studied. For example, frequency of use can distinguish occasional from regular or frequent users—who are at higher risk of dependence and other harms. Socioeconomic indicators provide information essential to tracking cannabis use in youth and other subpopulations who may be at higher risk of adverse effects.

Key indicators

(1) Frequency of use: Frequency of cannabis use is fundamental to determining associated risk. Daily or near daily use can be an indicator of misuse or dependence.

(2) Quantity used: Frequency of use alone is inadequate as a measure of risk. Research shows that the amount of cannabis consumed per day of use by frequent users (daily or nearly daily) is about three times that consumed by once-a-month users.[9] However, accurate measures are difficult to ascertain, largely because a standard unit of cannabis remains undefined—unlike substances such as alcohol (ounces/drinks) and tobacco (cigarettes, packs per year).[10] Accurate labels of weight (perhaps applying equivalencies of dried cannabis to fresh, edible products, beverages, and solid/liquid concentrates and seeds) would partially address this dilemma—at least for legally purchased cannabis products. It is still unclear what information product labels will contain.

(3) Purpose of use (medical, non-medical, or both): Distinguishing users of cannabis for non-medical purposes from those using cannabis to treat symptoms or disease will be key to interpreting the impact of the new law. However, substantial proportions of cannabis users indicate they use it for both medical and non-medical purposes; this group will need to be categorized separately.[11]

(4) Method of exposure: Cannabis can be smoked, vaporized, consumed in edible products, or absorbed topically and sublingually. Uptake of the psychoactive constituents of cannabis differs according to method of consumption and product design[12]. Smoking is the most common method of cannabis consumption, giving rise to the concern that facilitating access and thus normalizing smoking could encourage tobacco smoking. Eating cannabis products also confers particular risks—not only because the amount of active ingredient may not be known, but also because of the delay before the onset of intoxicating effects, and other issues related to food preparation safety. The popularity of edibles has been associated with rising rates of overdoses (including among children who unknowingly consume products containing cannabis), leading to increases in emergency room use and calls to poison control centres.

(5) Socioeconomic, socio-demographic covariates: Information on socioeconomic and ethnic characteristics, including age, gender, household income, labour force participation, education and Aboriginal identity is essential to monitoring cannabis use patterns across the population and analysis aimed at identifying subpopulations at risk of harm.

Current suite of surveys, adaptations and enhancements

Basic measures of cannabis use are included in two surveys designed for surveillance purposes. Content required to measure cannabis use has been greatly expanded by the Canadian Tobacco, Alcohol and Drugs Survey (CTADS), and the National Cannabis Survey (NCS) was initiated in 2018.

Canadian Tobacco, Alcohol and Drugs Survey (CTADS): Health Canada has requested substantial additional content for the 2019 survey, at which time it will be renamed the Canadian Alcohol and Drugs Survey (CADS).

CTADS' (and CADS') sampling strategy of focusing the survey on people aged 15 to 24 will make it possible to track trends in cannabis use in minors, and thus to evaluate the success of the *Cannabis Act*'s goal to prevent young persons from accessing cannabis. The survey also includes a question on Aboriginal identity, allowing the monitoring of cannabis use in this population.

National Cannabis Survey (NCS): The NCS is a new rapid cross-sectional, Internet-based survey developed by Statistics Canada to gain a better understanding of the frequency of cannabis use and monitor changes in use as a result of the planned legalization of cannabis for non-medical use.

There are also a number of Statistics Canada surveys that measure general social trends of the population and include questions on cannabis use. These include the Aboriginal Peoples Survey (APS) and the General Social Survey (GSS). Furthermore, the 2019 cycle of the Survey of Household Spending (SHS) will include questions on household spending on cannabis for medical purposes and for other purposes.

Limitations, gaps and development opportunities

Data for all of the indicators identified as essential to monitoring cannabis use are covered by at least one of the two core surveys mentioned above. Some limitations to data quality and target population coverage point to areas for consideration:

(1) Quantity used: Questions related to quantity of cannabis used appear only in the NCS. Reporting accuracy regarding quantity is problematic simply because most users are unaware of or unconcerned about the precise amount of cannabis they consume. After the legal retail sales of cannabis products begin, people's knowledge and ability to more accurately report the quantity of products they use is expected to improve. Of course, variations among provinces and territories in product availability, unit size and labeling requirements are inevitable. Findings from the NCS will help efforts to develop effective means of assessing quantity.

(2) Residents of the territories and reserves partially covered: CTADS excludes residents of the territories, although new cycles of the NCS will include samples in the three capital cities of the territories (Yellowknife, Whitehorse and Iqaluit). Both the CTADS and the NCS exclude residents of reserves from their survey samples.

(3) Statistical power: Cannabis users comprise a substantial but still small subpopulation, and certain categories of interest (e.g., people at risk of cannabis misuse disorder) is a small fraction of users. Therefore, in surveys with a limited sample size, cell sizes will be small—restricting the extent of possible disaggregation.

Public health and health care

A key concern regarding the legalization of cannabis for non-medical use is its potential impact on health and the health care system. The indicators below are necessary for research into health and health care issues associated with cannabis use, and therewith in providing

feedback regarding a major objective of the cannabis bill—protecting public health and safety.

Key indicators

(1) Age at first daily or regular use: Early age of regular use of cannabis increases the risk of subsequent dependence or misuse.

(2) Pattern of use: Information on quantity, frequency and age of initiation of daily or near-daily use can be used to develop a measure upon which dose-response analysis can be based. This approach is used for other substances such as alcohol (drinks per week, binge episodes per month) and smoking (packs per day, packs per year) to quantify associations with health outcomes such as disease and hospitalization.[13]

(3) Anxiety and depression: Cannabis use has been associated with mental disorders including anxiety, depression and, occasionally, psychoses.

(4) Cannabis misuse: Estimating the prevalence of harms associated with cannabis use will be critical from a population health perspective; frequency of use or quantity consumed is not always sufficient.

(5) Co-use with other substances: The use of cannabis with other substances including tobacco, alcohol and illicit drugs is an important public health concern. For example, if tobacco is combined with cannabis in the same joint, or cannabis and alcohol are consumed on the same occasion, or the act of smoking cannabis facilitates tobacco smoking by normalizing the behaviour, the health impacts of cannabis use are potentially compounded.[14]

(6) Driving, operating machinery or being a passenger in a vehicle operated by someone following use: Cannabis use impairs judgement and reaction time, thereby increasing vehicle crash risk. Monitoring trends in cannabis-impaired vehicle use by subpopulations (e.g., age group and sex) or geography (e.g., province and rurality) will provide information that could help target potential educational programming.

(7) Use during pregnancy: Cannabis use in pregnancy has been linked to changes in the fetal brain and lasting adverse effects. Accurate assessment of cannabis use during pregnancy is problematic; self-reported rates considerably underestimate those based on toxicology screening.[15] Survey findings will therefore require careful interpretation.

(8) Medical consultations attributable to cannabis use: To assess the potential impact of legalizing cannabis for non-medical use on the health care system, trends in accessing the following services resulting from cannabis use should be determined: outpatient care, walk-in clinic and physician consultations (e.g., for overdose, childhood poisonings, psychological reactions and severe vomiting syndrome); telehealth / poison control hotline inquiries; rehabilitative treatment; and mental health care.

Current suite of surveys, adaptations and enhancements

Surveys included in this section focus on health and its determinants. They provide data to support surveillance, and analysis of factors associated with cannabis use and related health impacts. The richness of sample-based survey data is increasingly being amplified by linkage to administrative databases.

Canadian Community Health Survey (CCHS): To date, the CCHS has included an optional module on cannabis use and driving under the influence of illicit drugs. Various enhancements are under development. The Cannabis Use Module is intended as core content (i.e., non-optional) in 2019/2020. A scale to assess cannabis-related negative consequences will also be included.

The CCHS—by virtue of its large sample size, inclusion of 12- to 14-year-olds, rich array of variables reflecting risk factors, socioeconomic information and health status (physical and mental), along with its linkage capability—will be an excellent dataset that can be used to study the health impacts of the cannabis legislation. Aside from its unparalleled usefulness for research, the CCHS also permits estimates at the provincial and regional level, which will be essential to interpreting the influences of province-specific distribution models—especially as they pertain to the legislation's goal of preventing cannabis access to youth.

Canadian Health Measures Survey (CHMS): The Cycle 6 (2018/2019) of the CHMS includes new content related to cannabis use and frequency. Laboratory testing for urinary tetrahydrocannabinol (THC) and cannabidiol (CBD) is under consideration for inclusion, which would make it possible to carry out validity testing of self-reported cannabis use.

Canadian Health Survey on Children and Youth (CHSCY): The CHSCY is a new cross-sectional survey that will be conducted for the first time in 2019. It will cover the population aged 1 to 17 living in the provinces and territories. A module related to cannabis use will be administered to youth aged 12 to 17; questions address frequency of cannabis use, age at first use, perceived harm resulting from use, access and usual source.

Linkage of survey and administrative files: As the guardian of Canada's major national survey and administrative databases, Statistics Canada is uniquely equipped to carry out data linkage. Under the protection of the *Statistics Act*, linkage of existing surveys to administrative databases is a cost-effective means of filling data gaps that precludes the need to collect new data or recollect data held by other sources. Linkage enhances the potential usefulness to research of administrative data and surveys—even including, for example, those from past decades that can be linked to hospitalization data to examine risk factors in relation to subsequent health care use.

Statistics Canada will conduct linkage-based projects to gain a better understanding of the health and health system impacts of cannabis use. Linkage efforts will bring together the surveys described above with administrative data that could include the Discharge Abstract Database (DAD) and the National Ambulatory Care Reporting System—both of which are provided to the agency by the Canadian Institute for Health Information.

Limitations, gaps and development opportunities

Several of the key indicators that are necessary for conducting research on cannabis use and its consequences for health and health care use are currently well-covered by one or more of the surveys mentioned above. These include co-use with other substances; driving, operating machinery or being a passenger in a vehicle operated by someone following use; and use during pregnancy.

Coverage of other important indicators is incomplete and methodological challenges remain, offering opportunities for further development:

(1) Pattern of use: Quantity of cannabis used (one of the elements of pattern of use) is collected only in the NCS, so analysis of quantity in relation to other variables is limited. As measures of quantity are refined, it may become feasible to include them in other surveys including the CCHS.[16]

(2) Anxiety and depression: The cross-sectional design of the surveys precludes the establishment of a temporal relationship between cannabis use and subsequent anxiety or depression. Otherwise put, although cannabis use can be examined in association with emotional or mood disorders, it is not possible to determine whether cannabis use precedes their occurrence.

(3) Cannabis misuse: No consistent definition of cannabis misuse has been applied in surveys. Statistics Canada will work with experts to determine which measure is best-suited for incorporation in population-based surveys.

(4) Medical consultations attributable to cannabis use: Outpatient visits for cannabis overdose incidents that have been reported elsewhere are expected to rise slightly following the legalization of cannabis.[17] No nationwide data on hospital outpatient services, physician consultations, poison control hotline inquiries or rehabilitative treatment related to cannabis use are collected.

(5) Bias: The degree to which social desirability bias will affect response accuracy will likely change (i.e., decrease) over time as the acceptability of cannabis use increases with its legalization. People's willingness to report cannabis use is likely to rise, both in surveys and to health care professionals, and perceived risk associated with use is likely to fall. The interpretation of trends will need to be undertaken in consideration of such caveats.

(6) Coverage: Survey populations do not include residents of reserves or the population living in institutions; not all surveys cover the territories.

Public safety and justice

The indicators below have been identified as instrumental in measuring the impact of legalizing cannabis for non-medical use with respect to the incidence of criminal activity, law enforcement practices, the administration of justice and the efficiency of the justice system, as well as the broader implications for community safety and well-being. The preparation of this inventory of indicators leveraged research done by other federal departments, most notably research on cannabis performance metrics conducted by Public Safety Canada.[18]

Key indicators

(1) Police-reported cannabis offences: Bill C-45 will result in the creation of new offences related to illicit possession, distribution, sales, importation/exportation, and production of cannabis, in addition to offences specifically related to the involvement of youth in the commission of an offence. Monitoring the incidence of police-reported cannabis offences and the number of adults and youth charged with cannabis offences will provide an indication of the extent of criminal activity related to cannabis, as well as the enforcement of cannabis offences under the new regime.

(2) Court outcomes of police-reported cannabis offences: An explicit goal of the cannabis legislation is to deter criminal activity by imposing serious criminal penalties on those operating outside the legal framework. Data on the number of cannabis offences progressing through the criminal justice system, and the outcomes/punishments (particularly for trafficking, production and providing cannabis to youth) will be necessary metrics related to policy.

(3) Cannabis-impaired driving: The Government of Canada has introduced legislation (Bill C-46) to reform existing laws related to cannabis-impaired driving, and drug-impaired driving more generally, in parallel to the legislation legalizing cannabis for non-medical use. The legislation would introduce stricter punishments and permit police officers to conduct roadside intoxication tests. To assess the impact of legalization, it will be necessary to monitor the incidence of cannabis-impaired driving—measured by incidents of drug-impaired driving that come to the attention of police. Survey data on self-reported driving after cannabis use will also be useful for estimating the incidence of impaired driving that does not come to the attention of police. From a public safety perspective, it will also be necessary to monitor the number of fatal and non-fatal traffic accidents for which cannabis impairment is identified as a factor.

(4) Court processing times and the administration of justice: One objective of the cannabis legislation is to reduce the burden on the justice system associated with cannabis offences, particularly with respect to cannabis possession. In order to assess the impact of legalization on the efficiency of the criminal justice system, it will be necessary to monitor the incidence of criminal activity associated with cannabis offences and cannabis-impaired driving progressing through the justice system. Data on the number of incidents progressing from policing to courts, as well as data on case-processing times, court outcomes and other case-processing indicators will be of key interest to stakeholders.

(5) Criminal justice expenditures and investments in enforcement: To assess the financial implications of legalization, it will be necessary to compile data on expenditures related to cannabis offences and cannabis-impaired driving at the level of policing, courts and corrections. With respect to impaired driving more specifically, police agencies have indicated that the enforcement of drug-impaired driving is a significant challenge, and that the training and resources required to test for cannabis impairment are substantial.[19] From an enforcement perspective, it will be necessary to keep an account of investments in training and equipment made by police services for policing cannabis-impaired driving.

(6) Illicit production and cultivation: A proper assessment of the public safety impact of the new legislation will require research and data on the continued illegal production of cannabis, and the involvement of organized crime in cannabis-related offences. Potential indicators include the proportion of cannabis offences that involve organized crime, incidents of illicit cannabis production that come to the attention of police, and estimates of the revenues of the illicit cannabis market.

(7) Community safety and victimization: To assess the broader implications of the legalization of cannabis on community safety, it will be necessary to derive some measures of the association between cannabis use, victimization, trust and confidence in policing, and broader metrics of community safety and well-being, including more local data such as municipal by-laws, complaints and so on.

Current suite of surveys, adaptations and enhancements

The surveys included in this section focus on crime and victimization, police resources and the administration of justice. These administrative data holdings, social surveys and linked datasets can facilitate the analysis of the investments, processes, efficiencies and outcomes associated with the legalization of cannabis for non-medical use from a public safety perspective.

Uniform Crime Reporting Survey (UCR): The value of UCR in monitoring the effects of cannabis legalization will be increased by the following modifications: the UCR will be updated to reflect new cannabis offences, including illicit possession, distribution, selling, importation/exportation, production, and the use of a young person in the commission of a cannabis offence. Updates to reflect new drug-impaired driving offences will also be implemented, and developmental work is under way to determine the feasibility of collecting regulatory offences and provincial/territorial statute offences related to cannabis- and drug-impaired driving.

Police Administration Survey (PAS): For the 2018 survey cycle, content has been added to the survey in order to measure investments in training and enforcement by police services in response to and in preparation for legalization, including (1) expenditures on drug-impaired driving test equipment; (2) funds spent and received to prepare for the legalization of cannabis; and (3) the estimated number of hours of training intended specifically for cannabis legalization.

Integrated Criminal Court Survey (ICCS): Updates will be made to the ICCS to accommodate new *Criminal Code* offences related to cannabis- and drug-impaired driving. Investments in the ICCS are also being made to develop new standard indicators of court processing, including data on time elapsed from the laying of charges to disposition and the proportion of cases that proceed to trial or preliminary inquiry.

General Social Survey—Victimization (GSS): The GSS includes content on cannabis use and can be used to look at the correlation between self-reported cannabis use and self-reported victimization, perceptions of safety and other social outcomes.

Linked files: The potential for using data to monitor and assess the impacts of cannabis legalization on public safety is enhanced by record linkage opportunities through the continuum of the justice system (policing, courts and corrections) and other social and economic data sources (e.g., health, education, labour and income). Within the field of justice, the linkage of policing and courts files will allow for the analysis of the progression of cannabis offences and cannabis-impaired driving after they are brought to the attention of police through to court outcomes. A record linkage methodology could also be applied to identify the extent to which individuals charged with cannabis-related offences come into repeated contact with police—for drug crimes exclusively, or for other criminal activity.

Extending the potential of linkage across multiple domains (including justice, health, education, and income) opens up a number of analytical opportunities. Possible outputs include linking the following:

- justice data and Ontario Mental Health Reporting System Metadata (OMHRS) to analyze mental health outcomes of individuals charged with cannabis offences;
- justice to census data and other administrative data sources to determine whether certain subgroups (including visible minorities, First Nations people, Métis and Inuit) are overrepresented as accused in cannabis-related offences;
- justice data to tax records (T1 Personal Master File and T1 Family File) to analyze the economic situation of those implicated in cannabis offences;
- justice data to the Discharge Abstract Database (DAD) and the National Ambulatory Care Reporting System Metadata (NACRS) to analyze the hospitalizations, ambulatory cases and health outcomes of individuals charged with cannabis offences.

Limitations, gaps and development opportunities

(1) Police-reported cannabis offences: UCR data will offer an accurate reflection of criminal activity that comes to the attention of police and police enforcement of criminal activity related to cannabis; however this won't necessarily be a representation of the actual incidence of cannabis offences or the police resources allocated to the enforcement of cannabis-related occurrences. Furthermore, the UCR does not currently collect data on provincial statute and regulatory offences. If deemed feasible, investments and updates to the UCR will be required to collect and report on regulatory and provincial statutes related to cannabis and cannabis-impaired driving. While provincial legislation may be partially addressed, municipal by-laws will remain a significant gap as a measure of community well-being. Finally, the data availability and data quality of organized crime information collected via the UCR 2.2 module is very limited and would require significant improvement in reporting practices from police forces to yield meaningful metrics.

(2) Court outcomes of police-reported cannabis offences: In some cases, the analysis of the court outcomes of police-reported offences requires conducting a record linkage of policing and courts records, a process that might result in incomplete coverage. Furthermore, coverage limitations of certain jurisdictions and data elements may impact the interpretation of ICCS data.

(3) Cannabis-impaired driving: While UCR and ICCS data will provide indicators of the incidence of drug-impaired driving that come to the attention of police, data on the enforcement practices and efficacy of the detection of cannabis impairment are currently lacking. It might also be difficult to disaggregate cannabis-impaired driving from drug-impaired driving generally in ICCS data without data linkage.

(4) Criminal justice expenditures and investments in enforcement: Actual figures representing the expenditures by police, courts and corrections specifically and exclusively on cannabis offences and cannabis-impaired driving are not currently available nationally.

(5) Illicit production and cultivation: While police-reported data do provide some indication of the incidence of cannabis production, trafficking and importing/exporting, using the data to provide a more detailed indication of the amount or volume of cannabis seized or eradicated and the number of illegal grow-ops dismantled by police is limited. Furthermore, due to the currently illicit nature of cannabis, it is difficult to discern the scope and size of the cannabis market.[20] The presumption is that the legalization of cannabis will have a significant impact on the illicit cannabis market, but this will be a challenge to measure. Collecting improved data on cannabis use, self-reported sources of cannabis consumed, and interpreting the data in conjunction with sales data from the legal cannabis market could yield some estimates of the illicit market post-legalization.[21]

(6) Community safety and victimization: Monitoring the long-term impact of legalization will require investments in research on and analysis of cannabis use and cannabis offences within the context of the institutions and services in the continuum of community safety and well-being. Currently available data are oriented towards law enforcement and the criminal justice system, and lack a comprehensive view of all the actors involved in the maintenance of community safety and well-being (e.g., social services, paramedics and fire services).

Further metrics for the public safety impact of legalizing cannabis for non-medical use that are not currently addressed by Statistics Canada's data holdings can be identified. These data will require leveraging or integrating existing datasets, data development projects, data acquisition and investments in new linkage projects:

- The detection and enforcement of cannabis-impaired driving is expected to represent a challenge for law enforcement.[22] It is also expected that the processing of cases of cannabis-impaired driving may result in an additional burden on the court system. While Statistics Canada will have some data on the incidence of cannabis-impaired driving based on self-reported measures and incidents brought to the attention of police, data development work could focus on producing more information on the investments made on the detection of cannabis-impaired driving, the efficacy of testing devices and protocols for identifying cannabis-impaired driving, as well as the broader costs of enforcing and processing cases of cannabis-impaired driving through the justice system.
- Current users of cannabis for non-medical purposes are presumably directly or indirectly interacting with an illicit drug market and could be exposed to certain criminal associations. Research on the implications for recreational users who are no longer participating in the illicit cannabis market would provide more evidence of the impact of legalization. For example, research could examine the prevalence of victimization among cannabis users, pre- and post-legalization.
- Measuring the incidence of crime occurring in proximity to cannabis dispensaries would provide some indication of the broader community safety impact of cannabis legalization. Research linking UCR data to an address registry of cannabis dispensary businesses could monitor the impact these establishments have on crime in their respective communities.
- Statistics Canada does not currently collect data on police calls for service on a regular basis. The collection of such data, and particularly calls for service related to drug transactions or drug complaints corresponding to cannabis, could provide some indication of police workload resulting from

cannabis legalization. This could also provide some data on the more local implications of legalization with respect to public disturbances, and disputes about space, air quality, by-laws, etc.

Ultimately, monitoring the public safety impact of cannabis legalization will require continued investments, assessment of baseline indicators and targeted research projects.

Other social domains

Other social domains that will potentially be affected by legalization of cannabis for non-medical use include the education and labour sectors.

Key indicators

(1) School absenteeism, academic performance and school completion rates

(2) Work performance

(3) Work injury risk

(4) Absentee rates

(5) Employment stability and job loss

(6) Behaviours, attitudes of employers related to pre-employment and random probationary-period drug testing

(7) Implementation of workplace drug testing (e.g., post-incident or in safety-sensitive workplaces).

Current suite of surveys, adaptations and enhancements

Canadian Health Survey on Children and Youth *(CHSCY)*: This survey provides data on academic performance (overall average of marks), which can be examined in relation to cannabis use.

Limitations, gaps and development opportunities

(1) School absenteeism and completion rates: A challenge to the collection of national information on education outcomes is that the responsibility for education lies with the provinces and territories, and little information other than enrollment statistics is centralized. An important exception is the compilation of province-level data on cannabis use among school-aged youth.[23] This document, however, does not address performance or other school outcomes. An effort to coordinate pan-Canadian collection of comparable data is required. Statistics Canada will communicate with the Strategic Management Committee of the Canadian Education Statistical Council to discuss the respective roles of the agency, the provinces and territories in meeting needs for information.

(2) Work performance and labour force variables (e.g., hours worked, reason for unemployment): Currently, no national surveys collect information on work performance. Statistics Canada's Labour Force Survey collects data on employment, work absence, etc., but none on cannabis use. Adding pertinent content (i.e., work performance, work-related injury and labour force variables) to the CCHS would help address the information gap.

(3) Workplace drug testing: no surveys contain questions on workplace drug testing, either pre-employment or on-the-job.

Conclusion

In anticipation of the legalization of cannabis for non-medical use, Statistics Canada has made numerous advancements to its data collection systems to prepare for its role in assessing the legislation's impact. This document identifies key indicators required to measure the social effects and evaluate outcomes against the objectives of the cannabis bill.

Protecting public health and safety is an important goal of the legislation. The development of measures to assess potential health consequences of cannabis use—including anxiety and depression, dependence and cannabis-related medical consultations—is under way. Statistics Canada will continue to produce data that allow for the analysis of criminal activity related to cannabis, as well as the association between cannabis use and victimization. Measures of reported cannabis-impaired driving are well-established, although the infrastructure and monitoring systems for tracking cannabis-impaired driving incidents have not yet been completely established. Statistics Canada's social statistics system is well-positioned to evaluate the goal of the cannabis bill to prevent youth from accessing cannabis. Surveillance of cannabis use in all age groups is ongoing. Innovative information collection technologies designed to reach young people and encourage their participation are being implemented.

Administrative data will be effectively used to assess the goals of reducing cannabis-related criminal activity and reducing the burden on the police and courts for cannabis possession.

Finally, evidence that emerges from Statistics Canada's surveillance and analysis activities will provide the evidence base for public health messaging and risk-reduction campaigns—thus addressing the aim of the legislation to inform Canadians about the consequences of cannabis use.

Several factors will add to the challenge of monitoring the effects of the legalization of cannabis for non-medical use in this country. One such concern is the inevitable heterogeneity among provinces and territories, each of which will be responsible for structuring distribution, regulating sales, establishing minimum age of use (i.e., either leaving it at the age of 18 years, as specified in the proposed *Cannabis Act*, or raising it), etc. Initiatives relative to responsibilities that fall mostly under the authority of the provinces (such as workplace safety and school-based and public health-based programs that address the misuse and harms of cannabis) will vary across the country. Thus, the influence of such activities will also differ. In addition, designating a point in time from which to measure the impact of legalization will be necessarily arbitrary. Changes in attitude, behaviour and outcomes related to cannabis have already begun[24], and are occurring along a continuum.

The complexity of the science poses an additional challenge. A common observation throughout the epidemiological literature that addresses the effects of cannabis use is the difficulty of disentangling its effects from those of other influences. Many studies offer a typically cautious interpretation—emphasizing that the observed associations fall short of causality, and do not rule out the role of factors such as alcohol or other drugs, or other behaviours or socioeconomic contexts.[25]

For numerous reasons, the impact of cannabis legalization in Canada is difficult to anticipate. However, Statistics Canada will continue to collaborate with its partners to optimize its capacity to monitor outcomes and provide the evidence required to inform future strategies and policies.

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Summary of data availability related to cannabis use

Indicator	Data Source	Notes
Basic surveillance		
Frequency of use		
• Within the past year	CCHS, CTADS, CHSCY, CADS	
• Within the past 3 months	CHSCY, NCS, CADS, CTADS	
• Within the past month	CCHS, CADS	
• Daily	CCHS, CHSCY, CADS	
Quantity used	NCS	
Pattern of use		
• Quantity used	NCS	
• Frequency	CTADS, NCS, CADS	
• Age of initiation of daily/near-daily use	CCHS, CTADS	CADS and CTADS provide age of initiation in general, *not of daily or near-daily use*
Purpose of use	CCHS, CADS	
Method of exposure	CCHS, CTADS, NCS, CADS,	
Socioeconomic (SES), sociodemographic covariates	CCHS, CTADS, CHSCY, NCS	SES information not asked of youth aged 12 to 17 for CHSCY

Summary of data availability related to cannabis use

Indicator	Data Source	Notes
Public health, health care		
Anxiety, depression related to cannabis use	CCHS	Cross-sectional data; causality cannot be inferred
Cannabis use disorder (dependence, interference with normal activities)	CCHS, CTADS, CADS	Assessed by various scales
Co-use with other substances	CTADS, CADS	
Driving, operating machinery after use, being a passenger after use by driver	CTADS, CCHS, NCS, CADS	
Use during pregnancy	CADS	Pertains to births in previous 5 years
Health care use attributable to cannabis	DAD (reason for, length of stay in hospital)	No coverage of Quebec or mental health facilities; no centralized data on outpatient or physician consultations
Public safety, justice		
Police-reported cannabis offences	UCR	
Court outcomes of police-reported cannabis offences	UCR, ICCS,	
Cannabis-impaired driving	UCR, ICCS, PAS, CTADS, CADS	CADS asks about arrests for driving violations involving cannabis
Court processing times and administration of justice	UCR, ICCS	
Illicit production and cultivation	UCR	Limited to police-reported incidents of cannabis production
Criminal justice expenditures, enforcement investments	PAS	Limited data
Community safety and victimization	GSS (V), Linked files	
Other social domains		
School absenteeism, academic performance, school completion rates	CHSCY	CHSCY asks about overall average school marks
Work performance	No national-level data	
Work injury risk	No national-level data	
Absentee rates	No national-level data	
Employment stability, job loss	No national-level data	
Behaviours, attitudes of employers related to pre-employment and random probationary-period drug testing	No national-level data	
Implementation of workplace drug tests	No national-level data	

CADS: Canadian Alcohol and Drugs Survey
CCHS: Canadian Community Health Survey
CHSCY: Canadian Health Survey on Children and Youth
CTADS: Canadian Tobacco and Other Drugs Survey
DAD: Discharge Abstract Database
GSS (V): General Social Survey on Victimization
ICCS: Integrated Criminal Court Survey
NCS: National Cannabis Survey
PAS: Police Administration Survey
UCR: Uniform Crime Reporting Survey

Supplementary information: Survey descriptions

Canadian Tobacco, Alcohol and Drugs Survey

The Canadian Tobacco, Alcohol and Drugs Survey (CTADS) is a cross-sectional survey conducted biennially since 2013. The previous iteration of CTADS was the Canadian Tobacco Use Monitoring Survey. The main objective of CTADS is to provide prevalence data on tobacco, alcohol and drug use and the extent of harm related to usage. CTADS surveys people aged 15 and over, with a primary focus on 15- to 24-year-olds. The target population excludes people living in the territories and residents of institutions. The survey sample of CTADS is about 15,000 respondents, equally distributed among the provinces. Between 2015 and 2017, CTADS was modified to include additional content related to cannabis use. In 2017, in addition to questions on mode of consumption, questions were included on co-use with alcohol or tobacco, source (where obtained), driving within two hours of use, being a passenger in a vehicle operated by someone who has consumed it within two hours, use while pregnant and breastfeeding.

Canadian Alcohol and Drugs Survey

Additions to the Canadian Alcohol and Drugs Survey (CADS), 2019 (formerly called the Canadian Tobacco, Alcohol and Drugs Survey) include questions about specific cannabis products used in the past 12 months and frequency of use; frequency in the past 12 months of using substances in combination with cannabis, by specific substance; whether combination use (cannabis with other substance) was for the purpose of getting "high"; quantity of cannabis used in the past 12 months compared with that in the previous year; number of mornings during the past 30 days when cannabis was used to start the day; main medical condition and symptom (separately) for which cannabis was used (among users reporting use of cannabis for medical purposes); being a passenger in a motor vehicle driven by someone who had used cannabis, or both alcohol and cannabis, within the previous two hours; frequency of using cannabis and driving a motor vehicle within two hours; frequency of using cannabis and driving a motor vehicle within two hours that was involved in a collision; frequency of driving under the influence of cannabis and having interaction with law enforcement; frequency of being arrested for a driving violation related to cannabis use; current degree of willingness to publicly acknowledge using cannabis for nonmedical purposes compared with before legalization. Female respondents aged 15 to 44 who have given birth in the past five years are asked whether they used cannabis during their pregnancy; those who report breastfeeding are asked whether they used cannabis while breastfeeding.

National Cannabis Survey

The National Cannabis Survey (NCS) was fielded for the first time in February and March 2018; it will be conducted during each remaining quarter of the year. The target population comprises residents of the 10 provinces aged 15 and over. The survey is designed so that the data can be rapidly processed and basic variables disseminated quickly. The NCS contains questions on frequency of use, source of procurement, amount used, price paid by type of product, quantity of and price paid for last purchase, likelihood of use or change in consumption, and driving within two hours of use, along with sociodemographic information. If operational constraints permit, continuation of data collection for at least two years beyond the date of legalization would provide valuable information regarding any fluctuations in cannabis use.

Canadian Community Health Survey

The Canadian Community Health Survey (CCHS) is a cross-sectional survey of household residents aged 12 and over living in the provinces and territories. The survey contains numerous variables related to general health, health care use and sociodemographic characteristics, as well as information on lifestyle factors such as smoking and alcohol use, which are often associated with cannabis use. It is designed to produce estimates of health-related information at subprovincial levels of geography (health region or combined health regions). The survey was initiated in 2001; since 2007 the survey sample has numbered 65,000 people per year and data collection is ongoing.

Canadian Health Measures Survey

The Canadian Health Measures Survey (CHMS) is cross-sectional and collects information about general health through a household survey, direct physical measurements and

biological measures. The age range covered by the CHMS is from 3 to 79 years. Data collection is ongoing in the 10 provinces; the survey is currently in its sixth cycle (2018/2019). Sample sizes have ranged from 5,600 to 6,400 respondents per cycle. Survey weights allow pooling of the data from multiple cycles, which enhances the analytic potential.

Uniform Crime Reporting Survey

The Uniform Crime Reporting Survey (UCR) is designed to measure the incidence of crime in Canadian society and its characteristics. UCR data reflect reported crime that has been substantiated by police. Information collected by the survey includes the number of criminal incidents, the clearance status of those incidents and persons-charged information. The UCR Survey produces a continuous historical record of crime and traffic statistics reported by every police agency in Canada since 1962. Data from the UCR Survey provide key information for crime analysis, resource planning and program development for the policing community.

Police Administration Survey

The purpose of the Police Administration Survey (PAS) is to collect statistics on police personnel and expenditures by municipal, provincial and federal police services in Canada. Data from this survey provide information on total expenditures on policing and the number of officers in each province and in Canada as a whole, as well as the number of officers per 100,000 population. In addition, information on current and emerging issues related to policing in Canada is collected.

Integrated Criminal Court Survey

The objective of the Integrated Criminal Court Survey (ICCS) is to develop and maintain a national database of statistical information on appearances, charges, and cases in youth courts and adult criminal courts. The survey is intended to be a census of pending and completed federal statute charges heard in provincial, territorial and superior courts in Canada. The survey includes information on the age and sex of the accused, case decisions, sentencing information regarding the length of prison sentence and probation, and amount of fine, as well as case-processing indicators such as case elapsed time.

General Social Survey—Victimization

The main objective of the General Social Survey (GSS) on Canadians' Safety (Victimization) is to gain a better understanding of how Canadians perceive crime and the justice system, and to capture information on their experiences of victimization. It is the only national survey of self-reported victimization and is collected in all provinces and territories. The survey allows for estimates of the numbers and characteristics of victims and criminal incidents. As not all crimes are reported to the police, the survey provides an important complement to officially recorded crime rates. It measures both criminal incidents reported the police and those that are unreported.

Aboriginal Peoples Survey

The purpose of the Aboriginal Peoples Survey (APS) is to provide information on the social and economic conditions of status and non-status First Nations people living off reserve, Métis and Inuit. Topics include society and community, health and well-being, work and income. The survey asks questions about health-related behaviours including the use of marijuana, cannabis and hashish. The 2017 survey focused on economic participation.

Survey of Household Spending

The Survey of Household Spending (SHS) primarily collects detailed information on household expenditures. It also collects information about the annual income of household members (from personal income tax data), demographic characteristics of the household, certain dwelling characteristics (e.g., type, age and tenure) and certain information on household equipment (e.g., electronics and communications equipment).

Notes

1. See Parliament of Canada (2017).
2. See Rotermann and Macdonald (2018).
3. See Health Canada (2016, p. 6).
4. See Statistics Canada (2017a).
5. See Maslov et al. (2016).
6. See National Academies of Sciences, Engineering, and Medicine (2017).
7. See Sanmartin et al. (2016); Rotermann et al. (2015).
8. All current surveys are described in the Supplementary information section.
9. See Zeisser et al. (2012); Burns et al. (2013); Caulkins (2017).
10. See Hindocha et al. (2017); van der Pol et al. (2013).
11. See Rotermann and Pagé (2018).
12. See Health Canada (2013).
13. See Manuel et al. (2014).
14. See Caulkins et al. (2016).
15. See Young-Wolff et al. (2017).
16. See Maslov et al. (2016).
17. See Wang (2017).
18. See Maslov et al. (2016).
19. See Canadian Association of Chiefs of Police (2017).
20. See Macdonald and Rotermann (2017).
21. See Statistics Canada (2017b).
22. See Canadian Association of Chiefs of Police (2017).
23. See Young et al. (2011).
24. See Angus Reid Institute (2016).
25. See Caulkins et al. (2016); Lynskey and Hall (2000).

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